

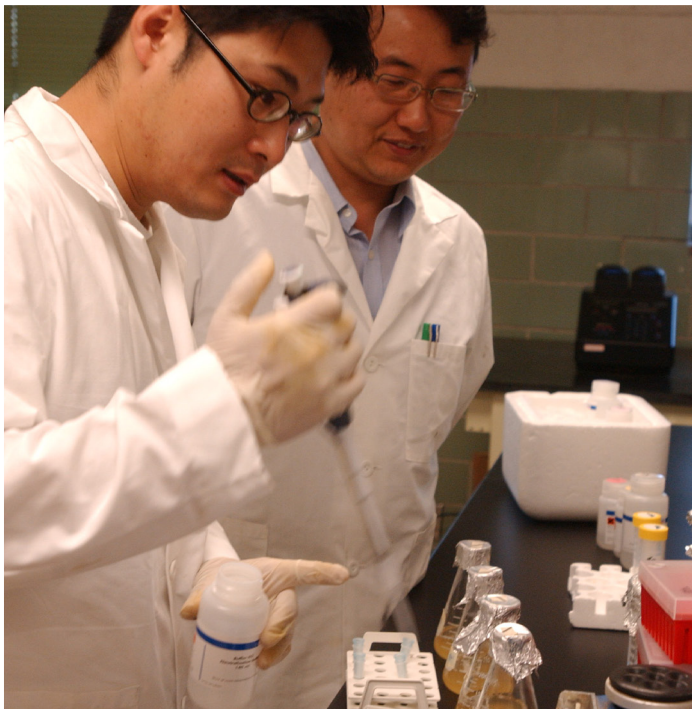
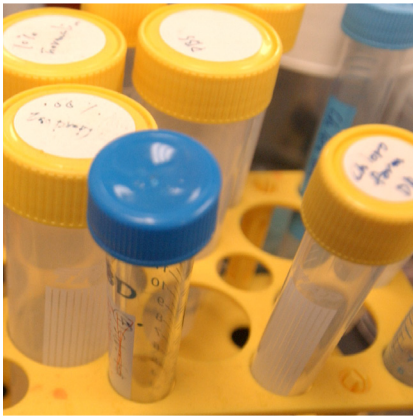
Understanding the Function of a Target Gene in Fat Cell Development and Its Potential to Combat Obesity

Kichoon Lee, Animal Sciences
Steven C. Loerch, Animal Sciences

Background

The increased prevalence of obesity over the last few decades has raised concerns about health risks associated with the problem. Economically, the United States spends an estimated \$117 billion annually in extra health costs related to obesity. As of August 2010, 28.8% of Ohio's population was considered obese. Obesity genes do not discriminate, no matter the species. Reduction of subcutaneous fat and enhanced intramuscular fat in animal carcasses will be beneficial to livestock producers and to the consumer. Understanding the interactions between nutrients, metabolites, genes, and biological pathways is vital if researchers are to be successful at manipulating the development and quantity of fat tissue in humans and livestock in the future.

Recently, genetic technologies have been successfully used to compare the expression profiles of several thousand genes simultaneously in different biological conditions. A novel gene that is highly expressed in fat tissue was identified by microarray studies conducted by Ohio Agricultural Research and Development Center scientists. The similarities to other known genes indicate that the novel gene might be involved in retinoic acid and fatty acid metabolism. An increasing number of researchers also report that retinoic acid regulates adipocyte—a cell that synthesizes and stores fat—development in vitro (in an artificial environment) and fat accretion in vivo (in a living organism).





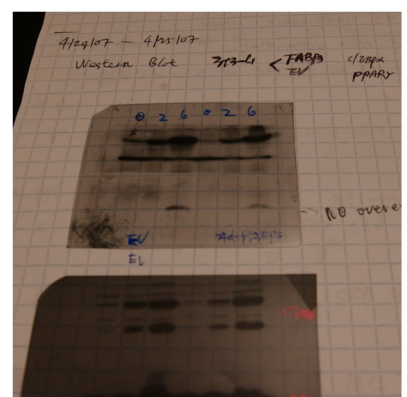
Objectives

The objectives of this study were to characterize protein function and to identify the role of a target gene in adipose (or fat) tissue development, using in vitro and in vivo systems including a transgenic mouse model. Researchers proposed that the gene product might be involved in vitamin A and lipid metabolism in fat cells, and also that the genetic modification of the target gene could affect adipocyte development and vitamin A metabolism.

Impacts

Scientists investigated the regulation of the gene expression during the process of fat cell development in vitro and in vivo systems. The gene was found to increase dramatically during differentiation in vitro and in vivo. Researchers developed genetic systems to deliver the target gene in a pre-adipocyte cell line for the large production of the target protein. In addition, several lines of mice genes were successfully generated to study the role of the target gene in adipocyte development in vivo.

This Ohio Agricultural Research and Development Center research study was the very first to show that the target gene can now serve as a new fat cell differentiation marker and is possibly involved in vitamin A metabolism. The preliminary data and resources obtained from the seed grant are now being used to prepare a National Institute of Health grant. The research will focus on more in-depth details in vitamin A metabolism and fat increase. Increased knowledge in the area of adipocyte development can potentially lead to more proactive measures to combat obesity.



This research is supported in part by state of Ohio funds allocated to the Ohio Agricultural Research and Development Center of The Ohio State University.

March 2010 FS52-10 www.oardc.ohio-state.edu/seeds